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## Infestation of Pitch and Shortleaf Pines by the Red Pine Sawfly in Southern New Jersey

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On May 30, 1956, numerous pines in widely scattered areas in the New Jersey Pine Barrens were observed to have been partially or completely defoliated by sawfly larvae. The area around Woodmansie, on the eastern portion of McDonalds Branch Watershed, Lebanon State Forest, Burlington County, was very heavily infested. The older leaves on a number of pine saplings in this area had been devoured completely above the sheaths, and the larvae had begun to feed on the needles of the elongating candles (figs. 1, 2). Many of the older trees had been 50 per cent or more defoliated. When the area was revisited three weeks later, no feeding larvae were found, but cocoons were abundant in crevices beneath the bark on the lower portions of the larger pine trunks and in the litter around the bases of the trees. The damage inflicted by the larvae was almost obscured by the development of the normal crop of new leaves. Even trees that had lost all their older leaves and the terminal portions of their new leaves did not present a particularly striking appearance, except that their crowns were noticeably sparse. No trees were observed that appeared to have been killed by the insects.

Observations on May 27, 1957, indicated that the sawfly population in the Pine Barrens had increased in density in most areas where the larvae had been found the previous year and that many new areas had

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FIG. 1. Sawfly larvae (*Neodiprion nanulus*) feeding on the leaves of a pitch pine.

been infested. During the winter of 1956–1957 a tract near the Lebanon State Forest sawmill, enclosed by Butler Place Road, Lebanon Road, and Coopers Road, had been subjected to a prescribed burn. These burns are light fires that are set purposely during the winter as multiple-purpose silvicultural treatments (Little, Allen, and Moore, 1948). An adjacent area, situated on the southwest side of Lebanon Road, had not been treated. Both areas had been lightly infested with sawfly larvae in

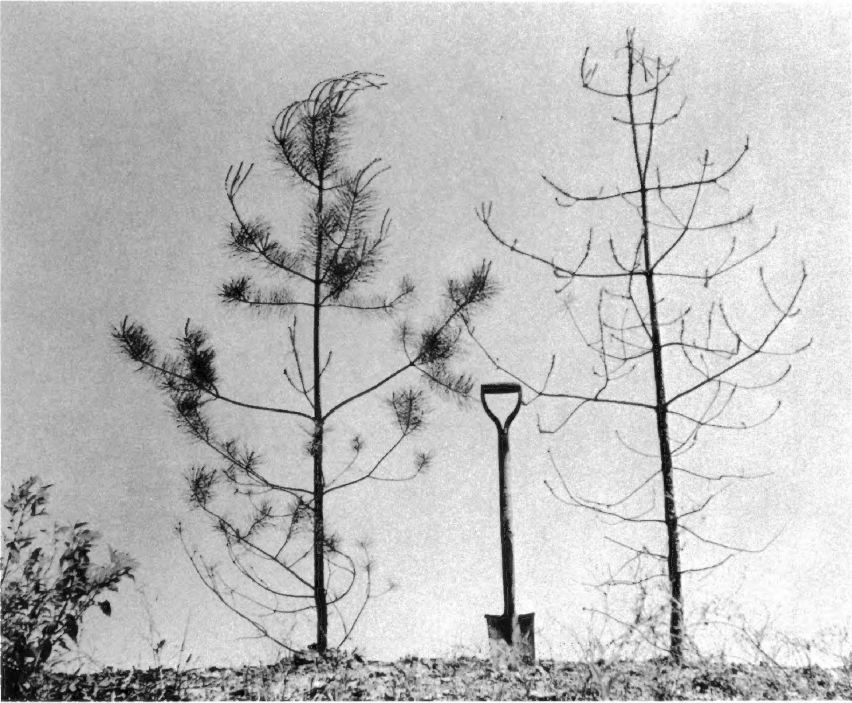


FIG. 2. Two young pitch pines from an area at Woodmansie, New Jersey. The specimen on the left has been lightly defoliated by sawfly larvae (*Neodiprion nanulus*). The tree on the right has been defoliated almost completely of old leaves, and many of the leaves on the elongating candles have been chewed.

1956, but the difference between the intensity of defoliation on the burned tract and that on the unburned tract was striking in 1957. On May 31, 1957, ocular estimates were made of the percentage of leaves devoured on 624 pines on the burned area and 527 pines on the unburned area to determine the difference between the effects of the insect populations on the two tracts. The trees were grouped into five classes

of defoliation: uninfested, lightly defoliated (1–25%); moderately defoliated (26–50%); intermediately defoliated (51–75%); and heavily defoliated (76–100%).

The sawfly larvae infested a significantly greater percentage of pitch pines (*Pinus rigida*) than shortleaf pines (*P. echinata*). Separate data were kept for the two species which occurred in mixture on the unburned tract. Ninety-eight per cent of the pitch pines on this tract were infested by sawflies. Of 20 shortleaf pines examined, one was 10 per cent defoliated, one was less than 1 per cent defoliated, and 18 (90% of the trees) were uninfested.

On the unburned area, 2 per cent of the sampled pitch pines were uninfested, 29 per cent were lightly defoliated, 8 per cent suffered moderate defoliation, 10 per cent were intermediately defoliated, and 51 per cent had been heavily defoliated. On the burned area, 27 per cent of the pines examined were uninfested, 44 per cent had been lightly defoliated, 8 per cent were moderately defoliated, 9 per cent were intermediately defoliated, and 12 per cent had suffered heavy defoliation. Thus, there was a significant difference in the sawfly damage to the pines on the two tracts. Forty per cent more of the trees on the burned area than on the unburned area were uninfested, or 25 per cent or less defoliated. In contrast, 39 per cent more of the trees on the unburned area than on the burned area were 76 per cent or more defoliated.

The sawflies overwinter in eggs that are oviposited in slits in the pine leaves. A large percentage of the eggs in the burned area must have been killed by the prescribed fire. Data are not available to indicate the lethal temperature for sawfly eggs or for the temperatures reached in the sapling layer or crown space of a forest during fires normally employed in prescribed burning. However, scorched needles in the lower and middle crowns of many larger pines on the burned tract indicated that the fire had flared up sufficiently to burn the canopy. It is apparent, therefore, that the temperatures produced by the fire, at least in the sapling layer and parts of the lower and middle portions of the overstory, were probably sufficient to cause the death of sawfly eggs. This fire was more severe than an average prescribed burn, so it cannot be assumed that every prescribed burn would produce so great a reduction in sawfly populations. It is certain, however, that even light ground fires during the summer, when the sawflies are pupating, would result in a significant reduction of the population on an infested area.

Observations in the two sampled tracts during the autumn of 1958 revealed no trees that had been killed or seriously damaged by the sawfly attacks, although a few large pine in other sections of Lebanon State

Forest had been killed (E. C. Rhodehamel, personal communication). The junior author also observed that in plantings of two-year-old pitch pines in Burlington County, several seedlings died after complete defoliation by the 1957 brood of sawfly larvae. A reduction in leaf area and, consequently, in photosynthetic potential may be expected to result in decreased diameter growth if the epidemic continues.

Waters and Waterman (1957) and Waters and Mook (1958) identified the sawfly that caused light-to-heavy defoliation of pines throughout southern New Jersey in 1956 and 1957 as *Neodiprion pratti paradoxicus*. McCoy (1958) estimated that in 1957 infestations of this insect covered approximately 1100 square miles and that those in 1958 covered 1630 square miles in south-central New Jersey. The sawfly was present again in 1959 (Anon., 1959). *Neodiprion lecontei* (Anon., 1957) and *N. pinirigidae* (Anon., 1959) were also reported to compose part of the sawfly populations in southern New Jersey.

On May 30, 1956, a number of sawfly larvae were collected from trees at Woodmansie and the unburned stand near the Lebanon State Forest sawmill, approximately 1.7 miles from Woodmansie. They were placed on pitch-pine leaves in rearing cages at the American Museum of Natural History, and cocoons were spun five to 12 days after collection. The adults, which hatched between October 26 and November 2, 1956, were very short-lived in captivity; none survived more than 48 hours. Adult specimens, including individuals from both collection points, were identified by B. D. Burks, Harold H. Ross, and W. Y. Watson as *Neodiprion nanulus nanulus* Schedl. (Specimens have been deposited in the collections of the Department of Entomology, the American Museum of Natural History.)

The Lebanon State Forest populations of *Neodiprion nanulus nanulus* may represent an isolated occurrence amid a general population of *N. pratti paradoxicus*, or *N. nanulus nanulus* may occur sporadically throughout the southern New Jersey infestations. In an effort to determine which of these alternatives is correct, W. E. Waters of the Northeastern Forest Experiment Station will secure specimens of adult sawflies from various stations in the Pine Barrens for determination by specialists (personal communication, 1960).

In any event, the present report represents the first record of *Neodiprion nanulus nanulus* on *Pinus rigida* and *P. echinata*. The host species listed previously were *Pinus resinosa* (including records from northern New Jersey), *P. banksiana*, *P. strobus*, and the introduced *P. densiflora* and *P. mughus* (Craighead, 1950).

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